

Recognition and Distribution of *Mytilus condoni* Dall, a Unique Pliocene and Pleistocene Bivalve from the Pacific Coast¹

BY

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(1 Plate)

INTRODUCTION

Mytilus condoni Dall (1890), a uniquely sculptured Pliocene mytilid from western Washington, has been a poorly known, if not doubtful, species ever since its description. Study of specimens from the recently rediscovered type locality now permits confident recognition of *M. condoni*. This species ranged as far south as central California during the late Pliocene. The broad distribution and late Pliocene and early Pleistocene age of known occurrences of this species point to its potential usefulness in provincial correlation.

Mytilus condoni was originally collected at Willapa [Shoalwater] Bay, southwestern Washington, and was described in a letter to the editor of the *Nautilus* by W. H. DALL (1890) in which he summarized some conchological observations in Oregon. The obscure titling of Dall's report, coupled with the facts that a holotype was not designated (Boss *et al.*, 1968: 87) and the species had not previously been illustrated, left the identity of this uniquely sculptured *Mytilus* in doubt. Later DALL (1904: 113) seems to have regarded this species as either a synonym or a closely related descendant of *M. middendorffi*, a widespread rugose species of middle Miocene age (ALLISON & ADDICOTT, 1973), in stating that the latter "... is represented in the Pliocene of Oregon by *Mytilus condoni* Dall...". The obscurity of the original publication is evidenced by GRANT & GALE's (1931) comment that they were unable to find a description of *M. condoni* and by WEAVER's (1942) omission of this species from his catalogue of Tertiary fossils of Oregon and Washington.

Much later, HERTLEIN (*in* MANNING & OGLE, 1950: pl. 8) regarded a mytilid from Humboldt County, California, now known to be this species, as undescribed but allied to *M. middendorffi*; he further noted that "This specimen may be similar to '*Mytilus condoni* Dall' which was mentioned in an earlier publication of the *Nautilus* (1911?), by Dall as occurring in Oregon." At about the same time identical material from this northern California locality was described as *M. highoohiae* MANDRA (1949: 104-105; fig. 1). Additional records of this species from localities in Humboldt County are recorded herein.

Reconnaissance of flat-lying siltstone and silty sandstone exposed in cliffs along the north shore of Willapa Bay has relocated what is here considered to be the *Mytilus*-bearing bed from which this species was originally collected. The fossils are from an unnamed unit mapped by HUNTING *et al.* (1961) as Quaternary terrace deposits. Although now readily accessible by paved road, these strata were difficult to reach and apparently unknown to three generations of paleontologists until construction of the coastline alignment of State Route 105 during the early 1960's. With the rediscovery of the type locality and availability of topotypic material, the finely sculptured *M. condoni* can be readily distinguished from the rugose middle Miocene species *M. middendorffi* Grewingk with which it has been confused (DALL, 1904; HERTLEIN *in* MANNING & OGLE, 1950) as shown by Figures 1 to 9. This discovery also shows that *M. condoni* is conspecific with the later described *M. highoohiae* Mandra (1949), which was based on material from the Pliocene Falor Formation of MANNING & OGLE (1950) of northwestern California. More importantly, this uniquely ribbed mytilid is widespread in shallow-water rocks of late Pliocene and early Pleistocene

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age and serves, therefore, as a useful species in stratigraphic correlation.

This note designates and illustrates type material for *Mytilus condoni*, designates the neotype locality, and considers the stratigraphic significance of this species. The original description is reprinted herein so as to make it more widely available.

SYSTEMATIC PALEONTOLOGY

Mytilus Linnaeus, 1758

Mytilus condoni Dall, 1904

Figures 3-9

1890. *Mytilus condoni* Dall, Nautilus 4 (8): 88-89
 1949. *Mytilus highooohiae* Mandra, Journ. Paleont. 23 (1): 104-105; fig. 1
 1950. *Mytilus* aff. *middendorffi* Grewingk, n. sp., Manning & Ogle, Calif. Div. Mines Bull. 148, pl. 8

Neotype (here designated): U. S. National Museum No. 647272

Neotype locality: USGS Cenozoic loc. M5219, near base of cliff on north side of State Route 105, 1020 m S., 900 m W. of NE. cor. sec. 5, T. 14 S., R. 10 W., Bay Center 7½' quad., Pacific County, Washington. *Mytilus*-bearing beds about 3.6 m thick overlying a 60 cm-thick *Macoma* bed. Unnamed formation of late Pliocene age.

Original description: "The most remarkable, and only new form in this bed [at Shoalwater Bay, Washington] is a fine *Mytilus* as large as *M. californicus* but distinguished from all other species of the genus by its surface which resembles that of *M. edulis* superimposed upon which are a few strong divaricating ridges extending from about the middle of the valves toward the posterior extreme. Many species have the surface covered with fine divaricating lines but I believe there is none known in which there are a few strong distant ridges, perhaps not exceeding half a dozen on the surface of a shell six inches in length, and having otherwise the form and aspect of a giant *M. edulis*. For this interesting species I propose the name of *M. condoni* in honor of its discoverer" (DALL, 1890: 88-89).

Discussion and Comparisons

Mytilus condoni is characterized by a network of moderately fine, divaricating ribs that bifurcate along the me-

dian line of the valves. The ribs are of variable strength but are best developed on the medial and dorsal parts of the valves and tend to reach the ventral margin at a much later stage of growth than the dorsal margin. The ribs are relatively flat-topped and are much broader than the interspaces. They are much more numerous than suggested by DALL (1890: 89); in fact, the very nature of Dall's description of this species leads to the speculation that it was made from memory and not with material at hand. The early growth stages are characterized by a smooth surface; the divaricate rib pattern develops after a length of about 25 mm is attained. On a few specimens, however, the smooth surface is maintained until a much later stage in growth (Figure 3). The shell margin is smooth except for the development of a few teeth in the umbonal region.

Assignment to *Mytilus* is suggested by the similarity of internal morphology to that of the cosmopolitan species *M. edulis*. On the interior part of the valve, the dentition, position of the anterior adductor muscle scar, and outline and position of the posterior retractors are all remarkably similar to *M. edulis*. The similarity (Figure 5) of external features to *M. edulis* has already been noted by DALL (1890).

This species was later confused with *Mytilus middendorffi*, a coarsely plicate species of middle Miocene age (Figures 1 and 2), by its describer (DALL, 1904). One can surmise that in the absence of designated and illustrated type material and perhaps also because the original specimen may not have been available, the critical features that readily distinguish this unique species from all other Pacific coast mytilids, as originally noted by DALL (1890), were overlooked in his later publication. An additional problem was the difficulty, until recently (HALL, 1958), of identifying *M. middendorffi* because only Grewingk's original line drawings were available and these appeared in obscure or difficult to obtain publications (GREWINGK, 1850; GRATACAP, 1912; SLODKEWITSCH, 1938). Actually, the two divaricately ribbed mytilids can be readily distinguished from each other as shown by Figures 1-9. *Mytilus condoni* is characterized by a pattern of moderately fine divaricate ribbing, whereas *M. middendorffi* has a few rugose plicae that produce undulatory deflections of the plane of commissure. The sculpture of *M. middendorffi* consists of two main folds and, usually, finer folds that branch off of the main dorsal fold in the posterior dorsal area of the valves.

Two paleontologists working with specimens of *Mytilus condoni* from northwestern California independently regarded their material as representing a new species (MANDRA, 1949, and HERTLEIN in MANNING & OGLE, 1950). MANDRA (1949: 104) endeavored to compare his specimens with the known Cenozoic *Mytilus* from the Pacific coast;

he did not, however, include *M. condoni* among the 23 species that were listed as having been reviewed. HERTLEIN (*op. cit.*: pl. 8) mentioned the possible similarity to *M. condoni* but regarded Dall's species as an unavailable name stating that "No description or figures of '*M. condoni*' are available . . ."

AGE AND CORRELATION

Although DALL (1890) originally described the occurrence of *Mytilus condoni* as Pliocene, he did not present supporting paleontologic evidence. The only subsequent mention of the age of unnamed unit along the north shore of Willapa Bay from which specimens of *M. condoni* have been collected was by MACNEIL (1965: G33), who considered these beds as probably Pleistocene, again without paleontologic documentation.

The shallow-water assemblage with which *Mytilus condoni* is associated at Willapa Bay (USGS locs. M1681, M1682, M5219) is dominated by living species, almost exclusively bivalves. Included are *Mya japonica* Jay, *Clinocardium nuttalli* (Conrad), *Macoma inquinata* (Deshayes), and *M. brota* (Dall)? There is one extinct species in the assemblage—*Macoma* n. sp.? Addicott (1969)—a large tellinid that occurs in late Pliocene assemblages from the Merced Formation (USGS loc. M1715) and the Purisima Formation (USGS loc. M3618) in central California. Accordingly, the age of this species at the neotype locality is considered to be late Pliocene.

In the Falor Formation of MANNING & OGLE (1950) of Humboldt County, northern California, *Mytilus condoni*

(Figure 7) occurs with the Pliocene cardiid *Clinocardium meekianum* (Gabb), together with some of the still-living species with which it is associated at the type locality [*Mya japonica* Jay, *Clinocardium nuttalli* (Conrad), and *Macoma inquinata* (Deshayes)]. FAUSTMAN (1964: 111) compared the fauna of the Falor with assemblages from the middle and upper parts of his Rio Dell Formation of the nearby Eel River basin. This correlation implies a generalized late Pliocene age for this occurrence of *M. condoni*. This species occurs in recent collections from the stratigraphically higher Carlotta Formation of OGLE (1953) of the Eel River sequence. It is associated with an unpublished molluscan assemblage of still-living species (F. H. Kilmer, written commun., June 5, 1973) suggestive of a provincial early Pleistocene age.

On the San Francisco Peninsula near San Bruno, California, *Mytilus condoni* (Figure 9) occurs in the lower part of the Merced Formation with *Ophiidermella graciosa* (Arnold) and other species indicative of a provincial late Pliocene age (Thomas Yancey, written commun., December, 1971).

In summation, *Mytilus condoni* has an extensive geographic range along the Pacific coast, and in each of the areas from which it is known, it occurs with mollusk assemblages of provincial late Pliocene or early Pleistocene age. For these reasons, and because of its especially distinctive sculpture, *M. condoni* appears to be an excellent index fossil for strata of this age along the Pacific coast. Its occurrences in northern California and western Washington are in bivalve assemblages suggestive of low intertidal or uppermost inner sublittoral depths in embayed or otherwise protected marine environments.

Explanation of Figures 1 to 9

Figure 1: *Mytilus middendorffi* Grewingk. USNM 647269. USGS Cenozoic loc. M3614. Temblor Formation, middle Miocene. San Benito County, California.

Figure 2: *Mytilus middendorffi* Grewingk. USNM 647270. USGS Cenozoic loc. M3614. Temblor Formation, middle Miocene. San Benito County, California.

Figure 3: *Mytilus condoni* Dall, USNM 647271. USGS Cenozoic loc. M1682. Unnamed formation, late Pliocene. Willapa Bay, Washington. ($\times 1\frac{1}{2}$)

Figure 4: *Mytilus condoni* Dall. Neotype. USNM 647272. USGS Cenozoic loc. M5219. Unnamed formation, late Pliocene. Willapa Bay, Washington.

Figure 5: *Mytilus condoni* Dall. USNM 647273. USGS Cenozoic loc. M5219. Unnamed formation, late Pliocene. Willapa Bay, Washington. ($\times 2\frac{1}{2}$)

Figure 6: *Mytilus condoni* Dall. USNM 647274. USGS Cenozoic loc. M5219. Unnamed formation, late Pliocene. Willapa Bay, Washington. ($\times 1\frac{1}{2}$)

Figure 7: *Mytilus highoohiae* Mandra. Holotype. UCMP loc. A4234. Falor Formation of MANNING & OGLE (1950), late Pliocene. Humboldt County, California.

Figure 8: *Mytilus condoni* Dall. USNM 647275. USGS Cenozoic loc. M5219. Unnamed formation, late Pliocene. Willapa Bay, Washington.

Figure 9: *Mytilus condoni* Dall. UCMP 10928. UCMP loc. D3364. Merced Formation, late Pliocene. San Mateo County, California.

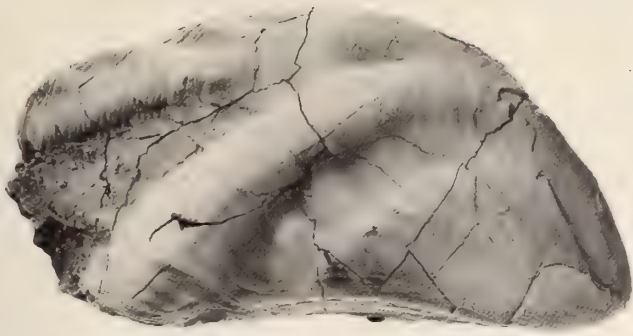


Figure 1

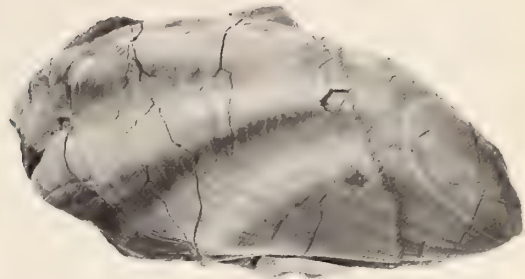


Figure 2

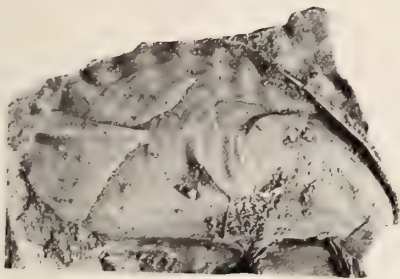


Figure 3



Figure 4

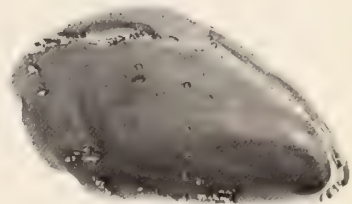


Figure 5

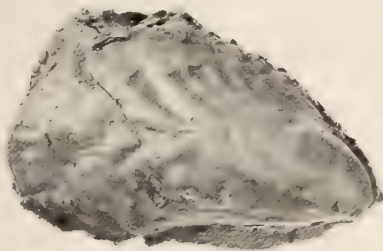


Figure 6

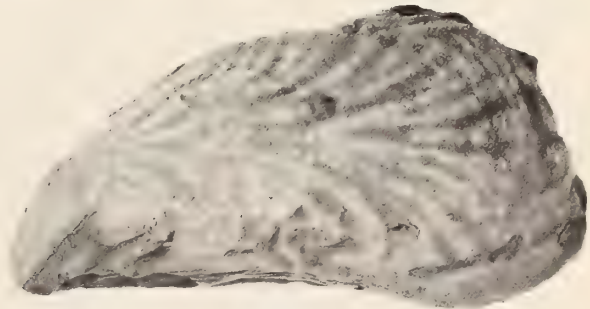


Figure 7

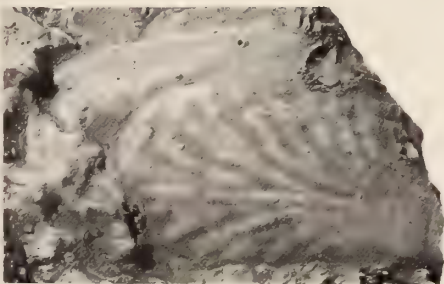


Figure 8

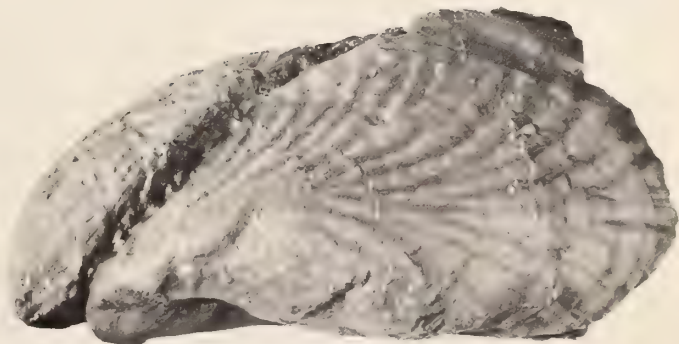


Figure 9

